WHAT IS CLAIMED IS

1. A method of forming a ferroelectric film, comprising the steps of:

forming a layer by a material that takes a metal state in a reducing ambient and an oxide state in an oxidizing ambient; and

depositing a ferroelectric film on a surface of said layer by supplying gaseous sources of said ferroelectric film and an oxidizing gas and causing a decomposition of said gaseous sources at said surface of said layer,

said step of depositing said ferroelectric film being started with a preparation step in which the state of said surface of said layer is controlled substantially to a critical point in which the state of said layer changes from said metal state to said oxide state and from said oxide state to said metal state.

2. A method as claimed in claim 1, wherein said material shows catalytic action in said metal state.

3. A method as claimed in claim 1, wherein said material is selected from any of iridium and ruthenium.

4. A method as claimed in claim 1, wherein said preparation step is conducted by processing said surface of said layer by an oxidizing gas and simultaneously a reducing gas.

5. A method as claimed in claim 4, wherein said preparation step is conducted first by processing said surface of said layer by said reducing gas and then processing said surface with said oxidizing gas and simultaneously said reducing gas.

6. A method as claimed in claim 4, wherein said preparation step is conducted by controlling a flow rate of said oxidizing gas and a flow rate of said reducing gas such that there appears said critical point in said oxidation-reduction reaction taking place on said surface.

7. A method as claimed in claim 4, wherein said oxidizing gas used in said preparation step is identical to said oxidizing gas used in said step of depositing said ferroelectric film.

8. A method as claimed in claim 7, wherein said oxidizing gas is an oxygen gas.

9. A method as claimed in claim 4, wherein said oxidizing gas used in said preparation step is a mixture of an oxygen gas and an inert gas.

10. A method as claimed in claim 4, wherein said reducing gas is a vapor of an organic solvent.

11. A method as claimed in claim 10, wherein said organic solvent is selected from ay of tetrahydrofuran, butyl acetate and xylene.

12. A method as claimed in claim 1, wherein said ferroelectric film has a perovskite structure.

13. A method as claimed in claim 1, wherein said ferroelectric film is any of PZT and SBT.

14. A method of fabricating a semiconductor device, comprising the steps of:

forming an active element on a substrate;

forming an electrode over said substrate in electrical connection with said active element, said

step of forming said lower electrode being conducted by using a material that takes a metal state in a reducing ambient and an oxide state in an oxidizing ambient for said lower electrode;

depositing a ferroelectric film on a surface of said electrode by supplying gaseous sources of said ferroelectric film and an oxygen gas and by causing a decomposition of said gaseous sources at said surface of said electrode; and

depositing an upper electrode on said ferroelectric film,

said step of depositing said ferroelectric film being started with a preparation step in which the state of said surface of said electrode is controlled substantially to a critical point in which a state of said electrode changes from said metal state to said oxide state and from said oxide state to said metal state.

15. A method of realizing a critical state of oxidation-reduction reaction on the surface of a layer that takes a metal state in a reducing ambient and an oxide state in an oxidizing ambient and shows a catalytic action in the metal state, comprising the steps of:

introducing said layer into a process space;

supplying an oxidizing gas and a vapor of an organic solvent into said process space; and

causing an oxidizing reaction and a reducing reaction on said surface of said layer in said process space,

said oxidizing gas and said vapor being supplied into said furnace with a proportion set such that there is caused an equilibrium between an

oxidation reaction caused by said oxidizing gas and a reducing reaction caused by said vapor on said surface of said layer.

16. A method of determining the state of an oxidation-reduction reaction taking place on a layer of a material that takes a metal state in a reducing ambient and an oxide state in an oxidizing ambient, said material showing a catalytic action in said metal state, said method comprising the steps of:

introducing said layer into a process space;

supplying an oxidizing gas and a vapor of an organic solvent into said process space;

causing an oxidizing reaction and a reducing reaction on said surface of said layer in said process space;

examining a state of said surface of said layer; and

determining a ratio of said oxidizing gas and said reducing gas that provides an equilibrium condition in which an oxidizing reaction and a reducing reaction equilibrate.

17. An apparatus for forming a ferroelectric film, comprising:

a reactor evacuated by a pump;

a stage provided in said reactor for holding a substrate;

a first source supplying an oxidizing gas to said reactor;

a second source supplying a reducing gas to

said reactor;

a third source supplying a gaseous source material of said ferroelectric film to said reactor;

a detector detecting an oxide film formed on said substrate on said stage; and

a controller controlling said first through third sources,

said controller controlling said first and second sources in response to an output of said detector such that there is realized a critical state of oxidation-reduction reaction taking place on a surface of said substrate.